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INT CL<sup>4</sup> B65H

(54) Sheet feeder

(57) An automatic feeder for delivering stacks of flat cardboard blanks to a box manufacturing machine comprises a magazine (3), a ramp (4) the forks 6 of the magazine being adapted to drive the stack (5) on the ramp (4) and additional forks (13) for continuing the movement of the stack (5) on the ramp (4) to permit the magazine (3) to return to receiving a new stack (15).

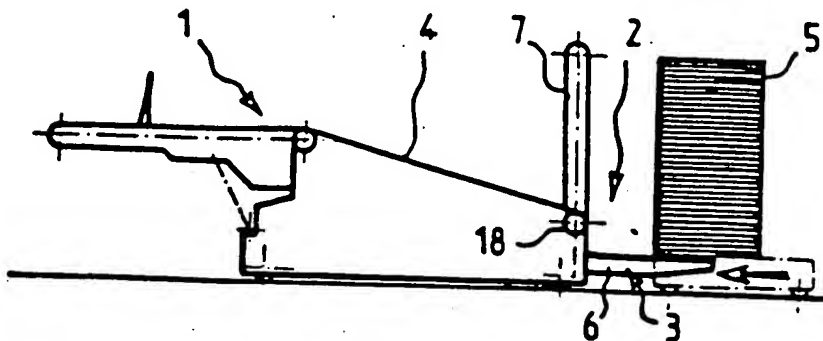


FIG. 1a

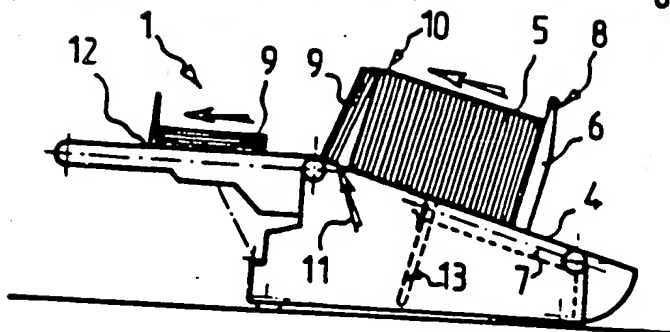


FIG. 2a

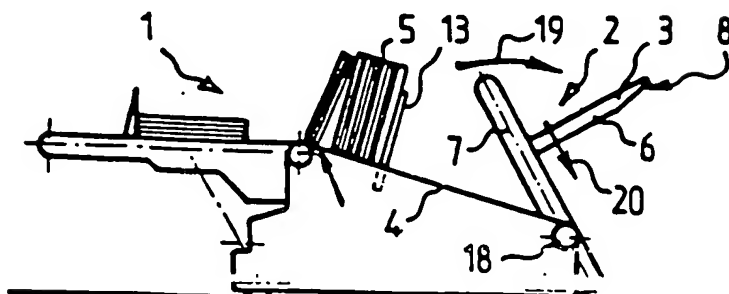


FIG. 3c

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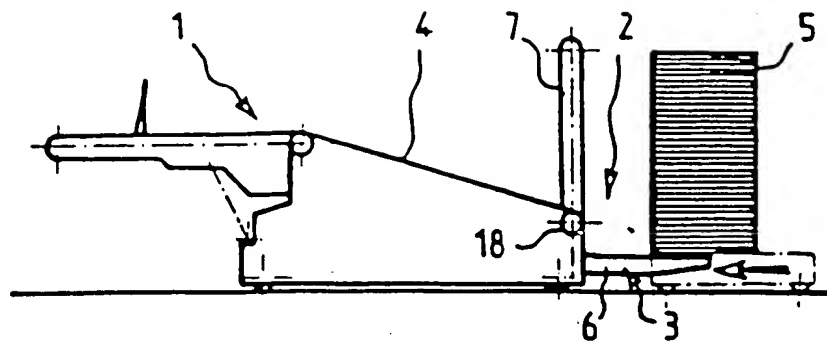


FIG. 1a

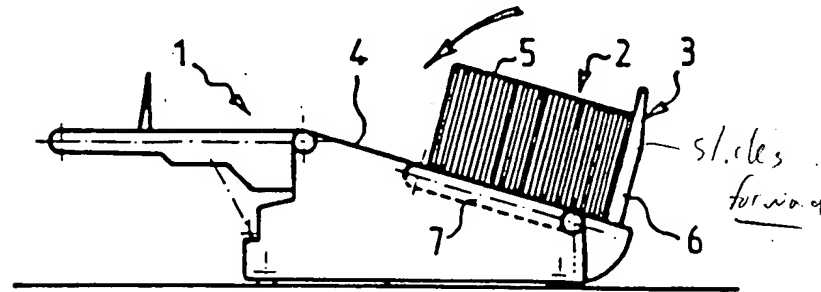


FIG. 1b

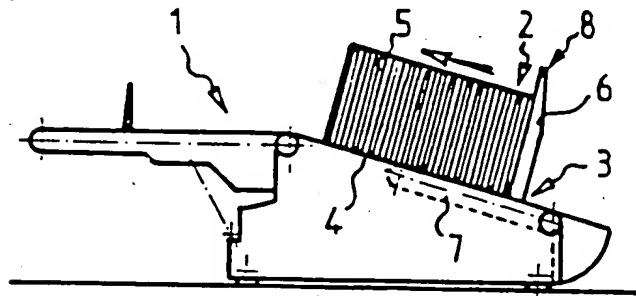


FIG. 1c

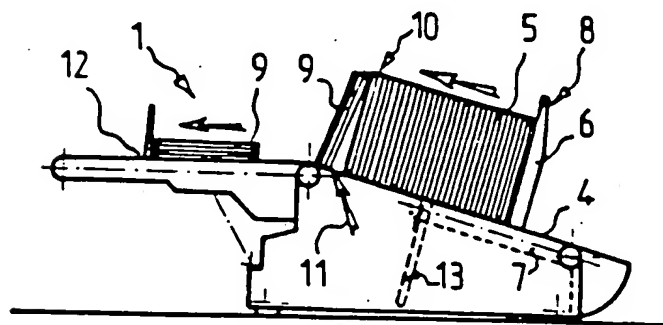


FIG. 2a

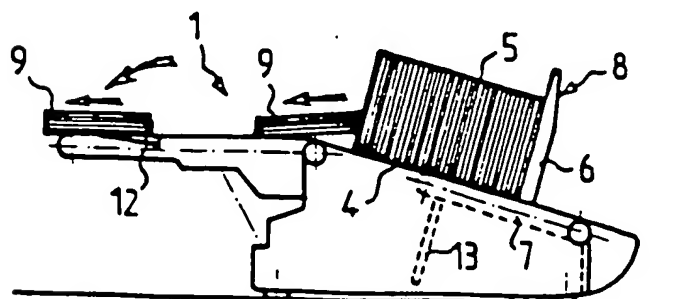


FIG. 2b

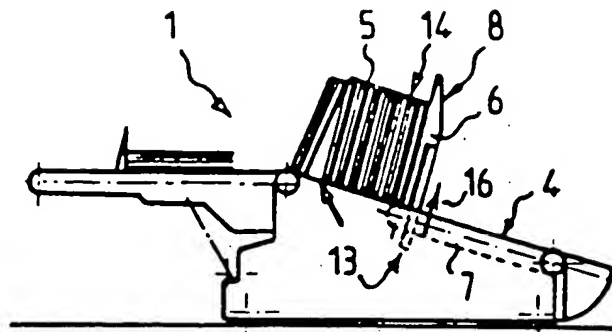


FIG. 3a

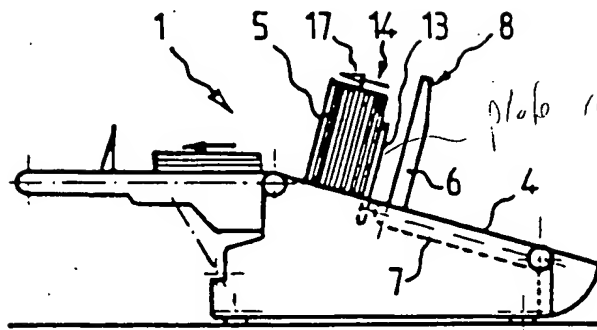


FIG. 3b

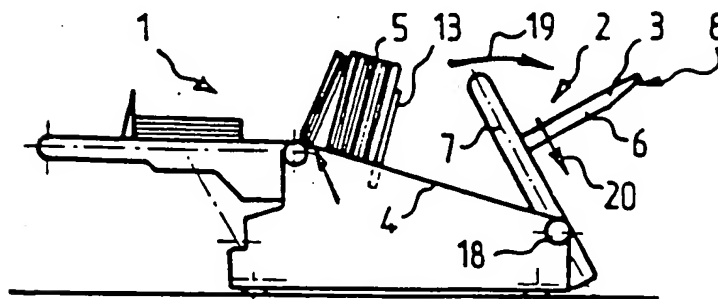


FIG. 3c

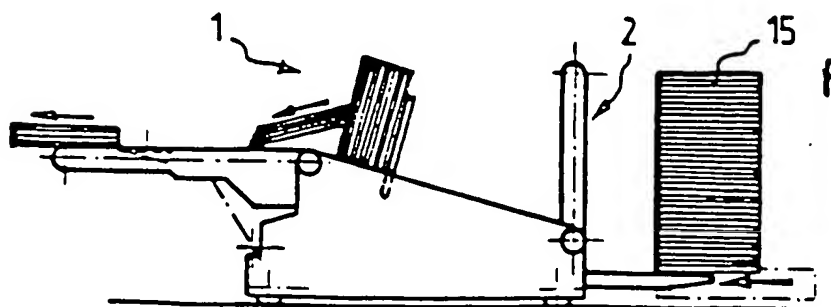


FIG. 3d

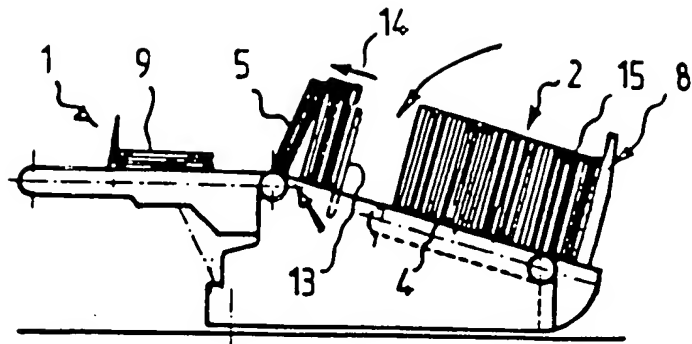


FIG. 4a

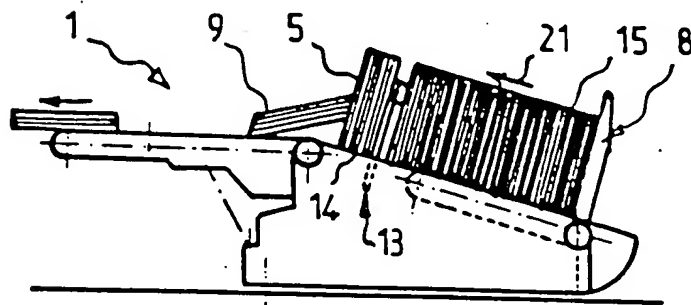


FIG. 4b

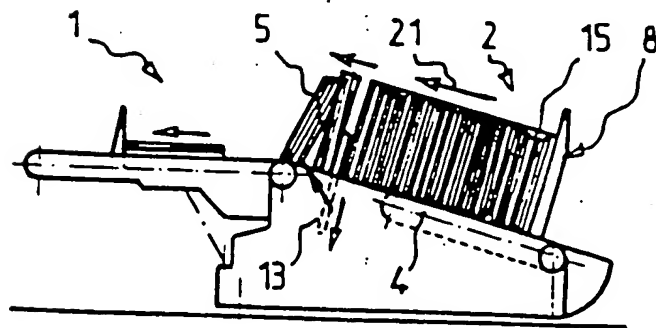


FIG. 4c

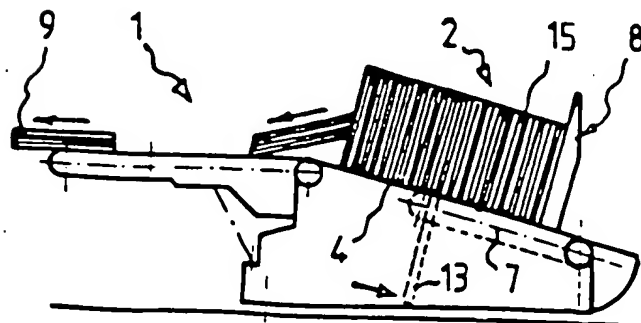


FIG. 4d

SHEET FEEDER AND METHOD OF USING SAMEFIELD OF THE INVENTION

This invention relates to automatic feeders, notably of the type intended for forming, from a stack of flat plates disposed horizontally, 5 bundles of said plates for feeding for example a transformation machine, and also to a method of delivering stacks of flat plates to this automatic feeder.

THE PRIOR ART

Nowadays, in many cases packing cases or boxes are manufactured 10 from more or less worked corrugated cardboard sheets.

These corrugated cardboard sheets are obtained from a corrugating machine delivering a continuous band or web which is subsequently cut into rectangular blanks of which the dimensions correspond more or less to the size of the case or box to be manufactured.

15 It is known to use cutting machines adapted to form stacks of horizontal sheets subsequently to the cutting of said band. After this stacking step, the various blanks are worked by other transformation machines arranged generally in series so that each machine works on successive batches of the product.

20 These transformation machines are designed notably for performing cutting steps and thus forming flaps or other portions of the packing, and/or forming grooves along the fold lines of the sheets to facilitate the assembling and printing of the packing.

In many cases these transformation machines are fed manually by 25 an operator who brings a stack of flat horizontal sheets or plates which are then picked up by the operator of the machine so as to form bundles as required for the proper operation of the machine.

On the other hand, due to the constant increment in the automatization of the cardboard industry automatic feeders have been developed 30 which accelerate production rates while requiring less operators.

In fact, various automatic feeders are already known which operate from a stack of corrugated horizontal cardboard sheets or blanks, comprise at their input end a magazine with reception means, and a ramp for receiving the stack of horizontal plates and depositing the plates on said ramp 35 so that the plate lie on edge, and other means for feeding the stack of sheets on edge and transferring them on said ramp to the site of subsequent treatments.

The bundle of sheets disposed on edge are formed by using various means, for example by causing the bundle of sheets disposed at the end of

the stack to move in a substantially vertical direction and then exerting a horizontal thrust against the projecting end of the unlevelled bundle so as to tilt this bundle to a flat position.

However, the feed rates thus obtained are limited by the feeding  
5 this device with horizontal sheets. In fact, systems of this type operate with a regular cycle throughout the use of the stack previously brought to the magazine, but at the end of this cycle the operation is interrupted during the time necessary for reloading the magazine with a new stack of horizontal sheets.

#### 10 SUMMARY OF THE INVENTION

It is the essential object of the present invention to provide an automatic feeder, notably of the type intended for forming, from a stack of flat horizontal plates, a plurality of bundles of said plates to be fed for instance to a transformation machine, and also a method of feeding  
15 stacks of flat horizontal plates to said automatic feeder to permit a continuous feeding of plates and avoid any idle period in the machine feeding cycles and thus avoid the inconveniences of known devices.

One object of the present invention is to provide an automatic feeder and a method of delivering stacks of flat horizontal plates to said  
20 automatic feeder which permits of operating under non-stop conditions whereby, during the utilization or processing of a stack of plates previously disposed in the magazine, a fresh stack of plates is prepared so that it will be available and picked up immediately at the end of the previously disposed stack, thus avoiding any loss of time.

25 Under these conditions, when the automatic feeder delivers plates for example to the layer-on of a processing machine, bundles of plates can be formed regularly, without any break from a stack of flat horizontal plates.

An advantageous feature characterising this invention with respect  
30 to the prior art lies in the fact that the feeder and its method of operation according to the invention are considerably time-saving, so that the resulting reduction in the production time will cut production costs while increasing production rates.

Other features and advantages of the invention will appear as the  
35 following description proceeds. Of course, this description is given by way of example, not of limitation.

According to the present invention, the automatic feeder intended notably for forming, from a stack of flat plates or sheets, bundles of plates to be delivered subsequently to a transformation machine comprises

essentially :

- a magazine consisting notably of reception means and of a ramp capable of receiving said stack of plates and to move said stack on said ramp,

5       - means for feeding the stack of plates by causing their translation on said ramp towards their site of use,  
and is characterised in that it further includes complementary plate retaining means whereby the stack can continue its movement on the ramp while preparing said magazine for receiving another or subsequent stack of plates.

10       The method of delivering stacks of flat plates to said automatic feeder according to the invention, in which:-

- a stack of flat plates is moved towards the reception means of the magazine and transferred onto the ramp,

- the plates are moved towards their site of use by feed means engaging the bottom of the stack,  
15       is characterised in that, before all the plates of the stacks are discharged :-

- the remaining plates of the stack are supported by complementary retaining means as they keep moving towards their site of use,

20       - the magazine is restored to its initial position for receiving a new stack,

- this new stack is loaded into the magazine and then transferred onto said ramp following the plates still present on the ramp.

In order to afford a clearer understanding of the invention, reference will now be made to the attached drawings,

#### THE DRAWINGS

FIGURES 1a - 1c illustrate diagrammatically the various steps of the loading of a stack of horizontal plates on an automatic feeder of known type,

30       FIGURES 2a and 2c illustrate diagrammatically an automatic feeder according to the present invention, during its operation consisting in forming bundles of plates supplied for example to a transformation or processing machine,

FIGURES 3a - 3d show the various steps, according to the present invention, consisting in separating the plates from the stack loaded on the automatic feeder of Figure 2, and

FIGURES 4a - 4d illustrate the various steps, according to the present invention, of the operation consisting in loading a new stack of plates following the picking up of the stack previously fed as shown in Figure 3.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is directed to provide an automatic feeder and a method of delivering flat plates to said automatic feeder.

The present invention is applicable notably in the cardboard transformation industry. In this specific field, corrugating plants are equipped, upstream of the transformation machines in which the cardboard sheets or plates are printed and cut for manufacturing packaging cases, boxes or the like, with a layer-on magazine fed from a feeder receiving from the corrugating machine the cardboard plates in a horizontal position, so as to form a vertical stack.

In the following description the invention is applied to the feeding of a layer-on section of a transformation machine. However, it is obvious that this invention is also applicable to any other types of machines in which similar operating conditions are encountered.

Likewise, the present invention is applicable more particularly to cardboard plates or sheets, but of course many other materials such as light multilayer materials, for example thin plywood, may be handled by the machine and method of the invention.

Nowadays, various types of feeder are known which, from a stack of flat horizontal plates, are capable of separating and picking up from said stack a bundle of plates and feeding said plates to transformation machines.

This known type of feeder is illustrated by way of example in Figures 1a - 1c.

The automatic feeder 1 consists as a rule of a magazine 2 having notably reception means 3 and a ramp 4 adapted to receive a stack of plates 5 and subsequently transfer the plates to a ramp 4.

More particularly, as shown in Figures 1a - 1c, the feeder 1 comprises a reception platform 6 and an apron 7 hinged about an axis 18 to the frame structure of the automatic feeder.

In a specific form of embodiment the reception platform 6 consists advantageously of an assembly of spaced parallel forks secured to the apron 7.

However, it will be seen that the reception platform may also consist of any other conventional and known lifting device such as a tray or an elevator, and of course in this case fastening devices are provided which are capable of picking up the plates from the stack by using complementary pick-up means to be described presently.

Moreover, to facilitate the insertion of the stack 5 on platform 6,



this platform may be provided with rollers extending between and on either side of the forks.

Thus, as shown in Figure 1a, the stack 5 of flat horizontal plates is deposited by using any known and suitable handling device onto the platform 6 of reception means 3. Then, by tilting the apron 7 about the hinge axis 18, the stack 5 is transferred to the ramp 4 as illustrated in Figure 1b.

To enable the movement of stack 5 and subsequently of the plates constituting said stack on the ramp 4 to the processing station, the automatic feeder 1 comprises feed means 8 consisting substantially, in the present instance and as illustrated diagrammatically in Figure 1, of the platform 6 of reception means 3.

In fact, in a particular form of embodiment the forks of platform 6 are mounted for longitudinal sliding movement in relation to the apron 7, under the control of drive means (not shown). Thus, the bottom of stack 5 is fixed to the forks 6 which, when actuated, cause the stack 5 to rise up the ramp 4.

Figures 2a and 2b illustrate a known type of feeder permitting, from a stack 5 of flat horizontal plates, the formation of bundles 9 to be delivered to the layer-on of a transformation machine. Moreover, this automatic feeder 1 incorporates the improvements constituting the subject-matter of the present invention.

The method of forming bundles of plates 9 from a stack of plates 5 comprises essentially the following steps :

- 25 - the level of a predetermined number of plates disposed at the top of stacks 10 and intended for constituting a bundle 9 is shifted substantially vertically, for example by resorting to a shoulder of ramp 4;
- a horizontal thrust is exerted (as shown for example by the arrow 11 in Figure 2a) against the projecting end of the shifted bundle 9 to as 30 to tilt this bundle to a horizontal position, and
- the thus tilted bundle 9 of plates is removed and directed to another processing station, as shown in Figure 2b.

In the case illustrated in Figures 2a and 2b, it will be seen that before transferring the bundle 9 to the next processing station, the stack 35 is pushed against a squaring member 12 for reshaping the bundle, if necessary. This squaring member 12 is retractable as shown in Figure 2b to permit the removal of the bundle before squaring the next bundle.

In hitherto known devices of this type, when the plurality of plates constituting the bundle 5 has been utilized, the manufacturing cycle

of the transformation machine is stopped due to the necessity of reloading the automatic feeder.

In fact, the feed means 8 (in the present instance the forks 6) must return to their initial position, whereafter the magazine 2 must be tilted to restore it to its initial reception position as illustrated in Figure 1a. Then, the cycle may start again as described hereinabove with reference to Figures 1a - 2b.

It is the essential object of the present invention to avoid this inconvenience by eliminating any idle period in the supply of flat plates.

10 For this purpose, the automatic feeder 1 comprises, according to the instant invention, complementary plate-retaining means adapted on the one hand to permit the continuous movement of the stack 5 on ramp 4 and on the other hand to prepare the magazine 2 for receiving another stack of plates, notably in the area of the reception means 3 of this magazine.

15 According to the form of embodiment of the invention which is described herein and illustrated notably in Figures 3a-3d and 4a-4d of the drawings, said complementary plate-retaining means 13 consist of a sliding tray adapted to be either retracted under the ramp 4, as illustrated in Figures 2 and 4b, or caused to project above and substantially at right 20 angles to the ramp, as shown notably in Figures 3a to 4c, to as to take over the function of the feed means 8 of stack 5 when this stack leaves the magazine 2, more particularly when the bottom 14 of the stack leaves the end of the magazine apron 7.

In this respect, in the form of embodiment illustrated, the configuration of the sliding plate of said retaining means 13 is such that it 25 can slide between the movable forks 6 constituting likewise said feed means 8.

According to the present invention, the method of delivering bundles of plates by using the automatic feeder 1 comprises the following steps :

30 - A - Firstly, as explained hereinabove with reference to Figures 1a to 2b:

a) a stack 5 of flat horizontal plates is formed or deposited on the reception means 3 of magazine 2 and then engaged on ramp 4. This last step is obtained by tilting the stack 5 on the ramp 4 so that the plates 35 lie on edge,

b) the plates are moved to their processing site or station by the feed means 8 exerting a thrust on the bottom 14 of stack 5;

- B - Then, before discharging completely the plates constituting said stack 5, as shown in Figures 3a to 3d :

a) the remaining plates of stack 5 are supported by the above-defined complementary retaining means 13 while continuing the transfer of the plates to their processing site or station,

b) the magazine 2 is restored to its initial position so that it can receive another stack 15 of flat horizontal plates,

c) the new stack 15 of plates is loaded into the magazine 2 and then transferred to the ramp 4 so as to follow immediately the plates already supported by this ramp.

With this sequence of steps, idle periods can be minimized when the end of the first stack approaches and a second cycle can be started. However, to eliminate completely those idle periods and according to the present invention and as illustrated in Figures 4b and 4c of the drawings, the following complementary steps are necessary :

- the new stack 15 is moved towards the bottom 14 of the preceding stack 5 retained by the complementary means 13,

- said complementary means 13 are retracted for subjecting again the stack thus formed to the new feed means 8.

In the forms of embodiment illustrated, the reception means 3 of the tilting magazine 2 comprise a set of movable forks constituting the base of platform 6 and the feed means 8 consist essentially of said set of forks 6.

The reception area of the complementary retaining means 13 consists notably and essentially of a second set of movable forks adapted to slide between the forks of said first set 6.

The first set of movable forks 6 is slidably mounted in the apron 7 of the tilting magazine 2.

Likewise, said second set of forks 13 is mounted for transverse sliding movement in relation to the ramp 4 so that this second set 13 can emerge from between the movable forks 6 of said feed means 8 and is mounted for longitudinal sliding movement in relation to said ramp 4 to permit the movement of the stack 5 and take over the function of feed means 8.

Figures 3 and 4 illustrate the sequence of steps described hereinabove.

Figure 3a shows the initial operation of the second set of forks 13 for continuing the action of forks 6 of feed means 8. The forks 13 of the second set emerge in a plane substantially perpendicular to the ramp 4, as shown diagrammatically by the arrow 16.

This outward movement is controlled by conventional detectors responsive to the passage of the lower portion of stack 14 on the upper portion

of apron 7 when the latter is coplanar with ramp 4.

When said retaining means 13 are in their outermost position, as shown notably in Figure 3b, these means 13 take over the function of the set of forks 6 of feed means 8 so as to hold the stack 5 and keep this 5 stack moving in the forward direction, as shown by the arrow 17.

Figure 3c shows the return movement of magazine 2 and notably the pivoting movement of apron 7 about its pivot axis 18 and the movement of translation of the platform 6 of reception means 3 to the lower position when the magazine 3 has been cleared completely from the remaining plates 10 of stack 5. These movements are denoted diagrammatically by the arrows 19 and 20, respectively, in Figure 3c.

Figure 3d shows the loading of magazine 2 with a new stack 15 of flat horizontal plates, a step similar to that corresponding to the first loading described in the foregoing with reference to Figure 1a.

15 In Figure 4a the new stack 15 is laid on ramp 4, a step similar to the one already described with reference to Figure 1b, except that in this case the machine is still being fed with plates from the last portion of stack 5.

Figure 4b shows the first step of the formation of a stack consist-  
20 ing of the last plates of stack 5 plus the new plates from stack 15.

This step consists in feeding the new stack 15 in the direction of the arrow 21 by actuating the feed means 8, whereafter the top of the new stack 15 is detected as it approaches the complementary retaining means 13. This detection is accomplished by using means well known in the 25 art and therefore a detailed description thereof is not deemed necessary.

When this detection takes place, the aforesaid complementary means 13 are retracted inside the ramp 4 as illustrated notably in Figure 4c.

These means 13 are also returned by translation to their initial position.

At the end of this retraction movement, as shown in Figure 4d, the 30 new stack 15, to which the plates remaining from the preceding stack 5 are added, permits of supplying flat plates to the automatic feeder without any idle period or any loss of time.

Of course, other forms of embodiment of the present invention and notably other applications and adaptations to automatic feeders of differ-  
35 ent types may be contemplated without departing from the basic principles of the invention, as will readily occur to those conversant with the art.

WHAT IS CLAIMED IS :

1. Automatic feeder (1), notably for forming, from an initial stack of plates (5, 15), bundles of said plates to be delivered for example to a transformation machine, which comprises :

5           - a magazine (2) including notably reception means (3) and a ramp (4) adapted to receive said stack of plates (5) and to transfer said stack to said ramp (4);

          - feed means (8) for moving said stack of plates (5) on said ramp (4) towards their site of use,

10 wherein complementary retaining means (13) are provided for retaining said plates and permitting the progress of said stack (5) on said ramp (4) and preparing said magazine (2) for receiving another stack (15) of plates.

2. Automatic feeder according to Claim 1, wherein said complementary retaining means (13) comprise a reception surface adapted to be re-  
15 tracted under said ramp (4) or to project substantially at right angles above said ramp for taking over the feed means (8) of the stack, when said stack leaves said magazine (2).

3. Automatic feeder according to Claim 2, wherein said reception means (3) of said magazine (2) comprise notably a platform (6) equipped  
20 with a set of movable forks adapted at least to be retracted inside said platform, said feed means (8) consisting essentially of said set of forks (6), said reception surface for said complementary retaining means (13) being so arranged that it can slide between said set of movable forks (6).

4. Automatic feeder according to Claim 3, wherein said complementary retaining means (13) consist of a second set of movable forks.  
25

5. Automatic feeder according to Claim 4, wherein said second set of forks (13) is mounted for transverse sliding movement in relation to said ramp (4) to permit firstly the outward movement of said second set of forks (13) between said movable forks (6) of said feed means (8), then  
30 the longitudinal sliding movement of said second set of forks (13) in relation to said ramp (4) to permit the transfer of said stack (5, 15) for taking over the action of said feed means (8).

6. Method of delivering stacks of flat plates to an automatic feeder (1) according to Claim 1, wherein ;

35           - a stack of flat plates (5) is loaded onto said reception means of magazine (2) and subsequently deposited onto said ramp (4);

          - said plates are moved towards their site of use by feed means (8) exerting a thrust against the bottom (14) of said stack (5), whereby, before discharging completely all the plates of said stack (5):

- the remaining plates of said stack (5) are supported by complementary retaining means (13) while continuing the transfer of said plates towards their site of use;

- said new stack of plates (15) is delivered to said magazine and then transferred onto said ramp (4) following the plates remaining thereon.

7. Feed method according the claim 6, wherein :

- said new stack (15) is moved towards the bottom (14) of the previous stack (5) controlled by said complementary retaining means (13),

- said complementary retaining means (13) are retracted so as to subject the assembly of the thus reformed stack to the action of said feed means (8).

8. Feed method according to claim 7, wherein:

- the top of said new stack (15) is detected as it approaches said complementary retaining means (13),

- said complementary retaining means (13) are sunk into said ramp (4) so as to form only one stack with the plates supported by said ramp (4).

9. Feeder for supplying bundles of sheets, the feeder comprising :

1) a magazine comprising receiving means for receiving a stack of sheets and for transferring the sheets to a ramp;

1i) feed means for moving the stack along the ramp; and

1ii) retaining means for retaining at least some of

the sheets, and moving the stack along the ramp while the magazine receives a further stack of sheets.

10. A feeder substantially as described herein with reference to any one or more of Figures 1 to 4.

11. A method of feeding sheets comprising the steps of

i) transferring a stack of sheets from receiving means to a ramp;

ii) moving the stack along the ramp,

iii) supporting at least part of the stack on retaining means; and

iv) moving the stack along the ramp while a further stack of sheets are loaded onto the receiving means.

12. A method of feeding sheets substantially as described herein with reference to any one or more of Figures 1 to 4.